CHAPTER 5

NONREINFORCED RIGID PAVEMENTS

5-1. Application. In general, all rigid pavements for roads, streets, and open storage areas at Army installations will be nonreinforced except for those conditions listed under paragraph 6-1, or unless otherwise required.

5-2. Design procedure.

a. Pneumatic-tired vehicles. For convenience in determining design requirements, the entire range of vehicle loadings and traffic intensities anticipated during the design life of pavements for the various classifications of Army roads and streets has been expressed as an equivalent number of coverages of an 18,000-pound single-axle loading. To further simplify the design procedure, the range of equivalent coverages of the basic loading thus determined has been designated by a numerical scale defined as the rigid-pavement design index. This index extends from one through ten with an increase in numerical value indicative of an increase in pavement design requirements. Values for the design index to be used during a mobilization situation are presented in table 5-1. Thus to arrive at the applicable design index, the designer needs only to determine the volume of traffic and the appropriate traffic category based on the distribution of traffic by vehicle type. Once the design index has been determined from table 5-1, the required thickness of nonreinforced pavement is then obtained from the design chart presented in figure 5-1. This design chart is a graphical representation of the interrelation of flexural strength, modulus of subgrade reaction, pavement thickness, and coverages of the basic 18,000-pound single-axle loading. The design chart is entered using the 28-day flexural strength of the concrete determined in accordance with paragraph 1-5. A horizontal projection is then made to the right to the design value for the modulus of subgrade reaction, k. A vertical projection is then made to the appropriate design-index line. A second horizontal projection to the right is then made to intersect the scale of pavement thickness. When the thickness from the design curve indicates a fractional value, it will be rounded upward to the nearest full inch thickness. All nonreinforced rigid pavements will be uniform in cross-sectional thickness. The minimum thickness of concrete for any Army road or street will be 6 inches.

b. Track-laying vehicles. Provision is made herein whereby the designer may determine pavement design requirements for track-laying vehicles in combination with traffic by pneumatic-tired vehicles, or for traffic by track-laying vehicles only. In most cases of traffic combining pneumatic-tired vehicles with track-laying vehicles having gross weights in excess of 40,000 pounds, the determination of the appropriate traffic category will be governed by the track-laying

Table 5-1. Rigid Pavement Design

Traffic Category	Rigid Pavement Design Index for Road or Street Classification	
	B	D-E
I	1	1
II	1	1
III	3	2
IV	4	3
V (60-kip track-laying vehicles, 15-kip forklift trucks):		
500/day	6	6
200/day	5	5
100/day	5	5
40/day	5	4
10/day	4	4
4/day	4	4
1/day	4	3
VI (90-kip track-laying vehicles, 20-kip forklift trucks):		
200/day	8	8
100/day	7	7
40/day	6	6
10/day	5	5
4/day	5	5
1/day	4	4
1/week	4	3
VII (120-kip track-laying vehicles, 35-kip forklift trucks):		
100/day	9	9
40/day	8	8
10/day	7	7
4/day	6	6
1/day	5	5
1/week	4	4

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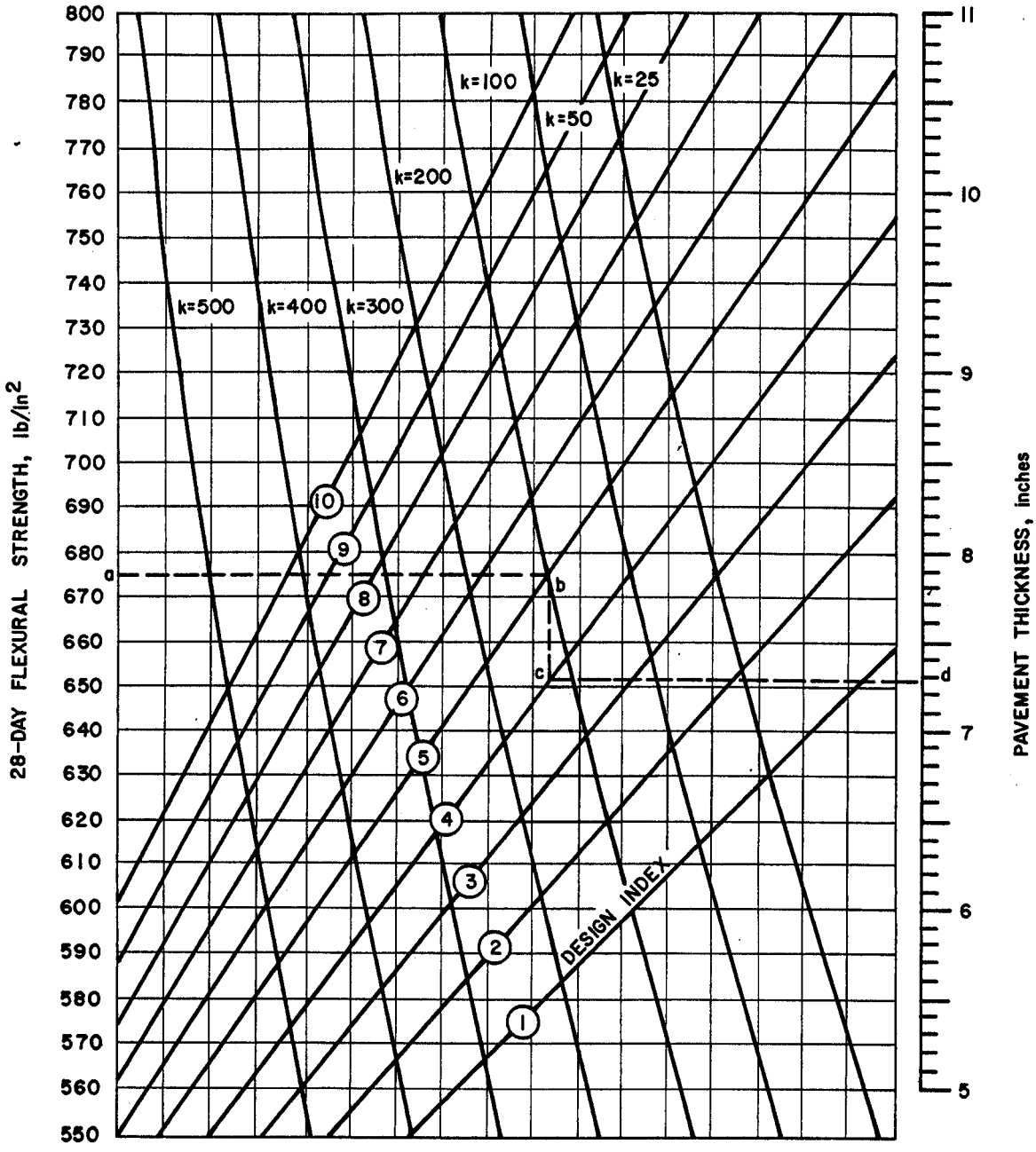

NOTE: Minimum allowable thickness of nonreinforced rigid pavement is 6 inches.

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FIGURE 5-1. DESIGN CURVES FOR CONCRETE PAVEMENTS, ROADS, STREETS, AND OPEN STORAGE AREAS

vehicle component of the traffic. In table 5-1, the traffic for Categories V, VI, and VII has been divided further into various levels of frequency. If the track-laying vehicle traffic is composed of vehicles from more than a single traffic category, it will be necessary for the designer to determine the anticipated frequency of traffic in each category in order to determine the appropriate design index. For example, 40 vehicles per day of Category VI traffic requires a greater pavement design index than does one vehicle per day of Category VII traffic. Thus, the designer cannot rely on maximum gross weight alone to determine rigid pavement design requirements for track-laying vehicles. Once the design index has been determined from table 5-1, the required thickness of nonreinforced rigid pavement is obtained from figure 5-1 as described previously.

c. Design examples. Appendix A contains several examples of nonreinforced rigid pavement design involving various traffic volumes and types of vehicles.

5-3. Design procedures for stabilized foundations.

a. Soil stabilization or modification. Soils that have been treated with additives such as cement, lime, fly ash, or bitumen are considered to be either stabilized or modified. A stabilized soil is one that shows improvement in load-carrying capability and durability characteristics. A modified soil is one that shows improvement in its construction characteristics but which does not show an increase in the strength of the soil sufficiently to qualify as a stabilized soil. The principal benefits of soil modification or stabilization include: reduction of rigid pavement thickness requirements when applicable, a stable all-weather construction platform, reduction of swell potential, reduction of the susceptibility to pumping, and reduction of the susceptibility to strength loss due to moisture.

b. Requirements. The design of the stabilized or modified layers will be in accordance with EM 1110-3-137. To qualify as a stabilized layer, the stabilized material must meet the unconfined compressive strength and durability requirements in EM 1110-3-137; otherwise, the layer is considered to be modified.

c. Thickness design. The thickness requirements for a rigid pavement on a modified soil foundation will be designed as if the layer is unbound using the k value measured on top of the modified soil layer. For stabilized soil layers, the treated layer will be considered to be a low-strength base pavement and the thickness determined using the following modified partially bonded rigid overlay pavement design equation:

$$h_o = \sqrt[1.4]{h_d^{1.4} - (0.0063 \sqrt[3]{E_f}\, h_s)^{1.4}}$$

where:

h_o = thickness of rigid pavement overlay required over the stabilized layer, inches
h_d = thickness of rigid pavement from design chart (fig 5-1) based on k value of unbound material, inches
E_f = flexural modulus of elasticity.
h_s = thickness of stabilized layer, inches

5-4. Design details. Typical details for the design and construction of nonreinforced, rigid pavements for Army roads and streets are shown on Standard Mobilization Drawing No. XEC-007.